Universidad de Alcalá

COURSE GUIDE

DIDACTICS OF MATHEMATICS

Bachelor's Degree in Primary School Education
University of Alcalá

Academic year 2017/18 and 2018/19
3rd year – 2nd term

COURSE GUIDE

Subject name:	Didactics of Mathematics
Course code:	**430016**
Degree taught in:	**BACHELOR'S DEGREE IN PRIMARY SCHOOL EDUCATION**
Department and field of knowledge: MATHEMATICS	
Type of Class:	BASIC
ECTS Credits:	6
Year and term:	THIRD YEAR – SECOND TERM
Teaching staff: Arántzazu Fraile Rey.	
Class Schedule:	to be confirmed on the subject's web page
Language of instruction:	English
Language of reading and audiovisual materials:	English

1. COURSE DESCRIPTION

The subject 'Didactics of Mathematics' is a basic course which focuses on the meaning and context of Mathematical Didactics practice, the knowledge and mastering of the Mathematics curriculum throughout Primary School Education, and establishing guidelines for developing the curriculum, and learning how to present materials simply and clearly working in the appropriate sequence order for developing mathematical skills, where the difficulties lies and what errors students are likely to make. In addition, the student is expected to independently develop their own learning, as well as the critical thinking and investigation skills required by their future profession.

Pre-requisites and Recommendations

It is highly recommended that the student has passed the subjects 'Mathematics I and II' to a satisfactory level, since the content studied in these two courses will be referred to constantly throughout this course.

A compulsory requirement for this subject is the ability to work in a peers and small group with different members of the class, including out with the normal classroom environment.

2. COMPETENCIES

Key competencies:

- Be able to express yourself correctly in English in a disciplinary environment.

- Be able to organize, plan and develop group work.

- Develop critical reasoning skills and reach agreements.

- Develop skills for searching for information and selecting documentation and/or activities.

- Promote ability to carry out independent learning.

Specific competencies:

- Understand the epistemological uniqueness of mathematics and the specificity of its teaching.

- Understand the mathematics curriculum in Primary School Education (PSE). Develop and evaluate this curriculum making use of suitable resources.

- Prepare, select and/or create materials and didactic resources and use them within the framework of teaching PSE mathematics.

- Suggest and solve problems related to daily life. Mathematically model real contexts, interpret the results based on the original context and its application.

- Encourage introductory experiences with information computer technology (ICT).

- Assess the relationship between mathematics and the rest of the sciences as one of the pillars of scientific thinking.

3. CONTENT

Theoretical foundations

Topic 1. Problem solving in PSE. Key processes in mathematical reasoning. Modelling, strategies and techniques in problem solving. Factors which intervene in learning how to solve problems.

Topic 2. Natural numbers and how to teach them. Natural numbers and place value. Models for Arithmetic, addition and substration structures, multiplication and division structure. Mental calculus strategies. Written methods for basic arithmetics. Resources and materials for teaching natural numbers and their arithmetic. Arithmetic word problems.

Topic 3. Magnitudes and their measurements. Building measurement concepts. The meaning and process of measuring. Methodology for teaching magnitudes in PSE (length, area, volume and capacity, weight and mass, time and monetary value). Related mathematical concepts. Estimation and verification of measurements. Materials and resources for learning magnitudes and their measurements. Problem solving.

Topic 4. Teaching rational numbers. Understanding the meaning and interpretation of rational numbers and their different representations. Fractions and ratios. Arithmetic of rational numbers. Decimal numbers and calculations with decimals. Proportions and percentages. Materials and resources for learning rational and decimal numbers. Word Problem solving.

Topic 5. Teaching geometry. Developing geometry thinking and concepts. Teaching and learning about shapes and properties, 3D geometry. Geometry and its relationship with other mathematical content units. Materials and resources for teaching geometry.

Practical Application

Practical classes aimed at designing teaching and learning activities within the following content units: problem solving; arithmetic and numeration; natural numbers; rational and decimal numbers; magnitudes and measurements; and geometry.

Practical classes reflecting the profession: aimed at preparing reports and focusing on four focal points which help develop the curriculum: Aims and objectives of mathematical education at Primary School level; developing basic competences; contents and assessment criteria.

Content units (topics can be specified here if deemed necessary)	Total hours
Topic 1	• 6 hours
Topic 2	• 12 hours
Topic 3	• 6 hours
Topic 4	• 12 hours
Topic 5	• 9 hours

4. TEACHING AND LEARNING METHODOLOGIES. EDUCATIONAL ACTIVITIES

Methodology for theoretical classes: different methodological strategies are integrated into the classes in which active student participation is fundamental. In this way students will be able to be in charge of their own way of learning, emphasizing the role of social interaction in acquiring knowledge.

Generally speaking, work carried out in the classroom consists of the following basic elements: teacher involvement (focused on theoretical questions which are primarily based on teaching practice and explaining the content and aims of the practical classes), inclusion of group work (which deals with practical documents produced by students and analyzing selected readings for this purpose, and participation in debates and in-class discussions and through the online platform).

Practical classes will take place combining classroom resources and computer resources in the classroom and will consist of putting into practice resources and specific didactic strategies according to a worksheet. Students will be organized into groups to complete work.

4.1. Distribution of credits

Number of class-contact hours:	45 hours + assessment tests
Number of hours of self-study:	102 hours
Total hours	150 hours

5. ASSESSMENT: Procedures, assessment criteria and grading criteria

In accordance with the current regulations, students will be assessed by a continuous assessment system, except from cases stated in article 10, section 3, of the Rules governing the learning assessment procedures (Normativa Reguladora de los Procesos de Evaluación de los Aprendizajes).

System of continuous assessment: This will consist of assessing class participation, assessing directed tasks and group work, presenting and defending this work and completing written tests which contain both theoretical and conceptual questions and solving practical activities and problems.

Final examination assessment: This exam will contain theoretical and conceptual questions, as well as solving practical questions and problems.

Understanding the subject contents and reasoning in problem solving will both be assessed.

a) ASSESSMENT CRITERIA.

The following aspects will be assessed:

1.- Understanding concepts.

2.- Acquiring knowledge.

3.- Finding reasoned solutions to problems and exercises.

4.- Active class participation.

5.- Accuracy and clarity in presentations (oral and written), including presentation of work and spelling.

b) GRADING CRITERIA

In order to successfully pass the subject, it is necessary to attend classes and develop this material through the practical sessions. It is also compulsory to submit scheduled work. Failing to do so will result in failing to obtain the following grades.

ASSESSMENT METHOD	PERCENTAGE WEIGHTING
Supervision and notes from the teacher who will assess the student's daily work and their adequate development of the theoretical and practical subject contents.	15%
Completion of practical work. Discretional problem solving tests.	20%
Partial Assessment Tests involving problem solving.	25%
Written Tests : Final Exam involving solving theoretical and practical cases.	40 %

Students will be considered as having successfully passed the subject in the ordinary examination period when the sum of their previous combined grade was awarded at least 5 marks.

The re-sit examination period will consist of an overall final exam for the subject with the same characteristics as in the final exam in the ordinary examination period.

6. BIBLIOGRAPHY

NTCM . Standards (2000). Principles and Standards for School Mathematics.

NTCM . (2014) Principles to Actions: Ensuring Mathematical Success for All

An overview of mathematical education, developing the Curriculum Principles in educational standards, which are detailed by topics as well as for educational levels ranging from preschool through to high school.

List of text books centered on understanding of central mathematical concepts and how to teach them:

Musser G.L, Burger W.F, Peterson B.E (2011). Mathematics for elementary teachers, a contemporany approach (9th edition). John Wiley and Sons.

Beckmann, S. (2011) Mathematics for elementary teachers with activities. (4th edition). Pearson.

Hyalock, D (2010) Mathematics explained for primary teachers (4th edition). Pearson

Van Walle, J.A. , Bay-Williams J.M., Lovin LA. H. and Karp K.S. (2013) Teaching student-centered mathematics. Developmentally appropriate instruction for grade PreK to 8. Pearson:

1.Teaching Student-Centered Mathematics: Developmentally Appropriate Instruction for Grades Pre-K-2 (Volume I),
2.Teaching Student-Centered Mathematics: Developmentally Appropriate Instruction for Grades 3-5 (Volume II

3.Teaching Student-Centered Mathematics: Developmentally Appropriate Instruction for Grades 6-8 (Volume III),

Liping Ma. (2010) Knowing and teaching elementary mathematics. Routledge